PROCEDURE 22 - Cranes, Hoists and Slings

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Synopsis

The purpose of this procedure is to establish requirements relative to the hazards associated with the use of cranes, hoists and slings in the workplace. It applies to all NWS facilities that operate portable and fixed cranes and hoists. The WFOs that utilize portable hoists such as the hoists in the radar domes and those used to lift instruments to the top of towers shall at a minimum follow the requirements of sections 22.3.1; 22.3.2; 22.3.4; 22.3.9; 22.3.10 b; 22.4; and 22.5.

Initial Implementation Requirements:

- **Analyze Site Operations versus Requirements of the Procedure**
- **Develop/Obtain Documentation/Information required for Site**
  - Obtain and file Cranes and Hoists Rated Capacity Certification. *(22.3.9b,e)*
  - File Load Testing Reports. *(22.3.9e)*
  - File Inspection Reports. *(22.3.9d, Attachment B)*
  - Obtain Manufacturer's Instructions/Manuals to establish Preventive Maintenance Program. *(22.3.9f)*
- **Designate Person to Administer Cranes, Hoists and Slings Procedure Requirements**
- **Provide Local Training of Site Personnel**
  - Hoists and Rigging Equipment Operators Training/Qualification. *(22.3.10)*
- **Inventory Material/Equipment (Procure as required)**
  - Hoists, Slings & Rigging Equipment Accessories. *(22.5.2d, 22.3.9)*

Recurring and Annual Task Requirements:

- **Perform Inspections/Assessment/Testing/Certification**
  - Conduct Inspection of Hoisting and Rigging Equipment. *(22.3.9a, Attachments A & B)*
  - Conduct visual Inspections of equipment prior to each use. *(22.3.9c)*
  - Conduct Annual Sling and Rigging Accessories Inspections. *(22.3.9d)*
  - Conduct Load Testing (125% capacity) of cranes and hoists. *(22.3.9b & 22.3.9e)*
  - Obtain Certification of new, re-installed and extensively repaired cranes, hoists and slings by a qualified inspector. *(22.3.9b)*
- **Review/Update Documentation/Information required for Site**
  - Maintain Annual Sling and Rigging Accessories Inspection Reports. *(22.3.9d)*
  - Maintain Annual Load Testing Reports/Certification *(22.3.9e).*
- **Provide Refresher Training of Site Personnel (If Applicable)**
  - Hoists and Rigging Equipment Operators Training/Qualification. *(22.3.10)*
- **Inspect/Replace/Maintain Material/Equipment**
  - Hoists, Slings & Rigging Equipment Accessories *(22.5.2d, 22.3.9)*

Cranes, Hoists and Slings Checklist

Requirements	Reference	YES	NO	N/A	Comments
Is initial and annual review of this procedure conducted and documented?	22.4.2				
Are safety practices/guidelines outlined in the procedure observed while performing hoisting and rigging operations?	22.3.1 - 4				
Do crane operators adhere to the safety requirements outlined in the procedure?	22.3.5 - 7				
Is hoisting/rigging equipment installed, maintained, operated, inspected and certified in accordance with this procedure?	24.3.9				
Does the damaged equipment get tagged with “DO NOT USE” tag?	22.3.9				
Are initial and annual inspections of all hoisting and rigging equipment performed and reports kept on file?	22.3.9a, Attachment A				
Are new, re-installed and extensively repaired cranes, hoists and slings load tested to 125% of capacity and certified by a qualified inspector prior to use and annually?	22.3.9b				
Are visual inspections of equipment conducted before and after each use?	22.3.9c				
Does the maximum acceptable load and the last test get posted on the crane or fixed hoist?	22.3.9e				
Are load testing reports/certifications maintained?	22.3.9e				

Requirements	Reference	YES	NO	N/A	Comments
Are manufacturer's manuals kept on file to establish preventive maintenance program of hoisting and rigging equipment?	22.3.9f				
Are only proper trained and qualified operators permitted to work with hoisting and rigging equipment?	22.3.10				

22 CRANES, HOISTS AND SLINGS

22.1 Purpose and Scope

As part of its goal to provide a safe and healthful workplace, the National Weather Service (NWS) is promulgating this procedure related to hazards associated with the use of cranes, hoists and slings in the workplace. This procedure applies to all NWS facilities that operate portable cranes and fixed cranes and hoists, specifically the NDBC. The WFOs that utilize portable hoists such as the hoists in the radar domes and those used to lift instruments to the top of towers shall at a minimum follow the requirements of sections 22.3.1, 22.3.2, 22.3.4, 22.3.9, 22.3.10 b, 22.4, and 22.5.

22.2 Definitions

Cable Reeving. A cable passing through a pulley or similar device.

Crane. A machine for lifting and lowering a load and moving it horizontally with the hoisting mechanism as an integral part of the machine. Cranes, whether fixed or mobile, are driven manually or by power.

Drum. A cylindrical flanged barrel of uniform (cylindrical) or tapering (conical) diameter on which the cable is wound for operation or storage. It may be smooth or grooved.

Field Office. A Field Office may include the following: Weather Forecast Office (WFO), River Forecast Center (RFC), Weather Service Office (WSO), and a Data Collection Office (DCO).

Hoist. A device which applies a force for vertical lifting or lowering.

Lift. The hoisting of a load.

Lifting Attachments. Hardware typically used in conjunction with a sling. Includes but is not limited to shackles, eye bolts, rings, etc.

Load Angle. The angle of a sling under load in degrees to the horizontal.

Operating Unit. For the purpose of this procedure, Operating Unit includes the National Centers for Environmental Prediction (NCEP), National Data Buoy Center (NDBC), NWS Training Center (NWSTC), National Reconditioning Center (NRC), Radar Operations Center (ROC), or the Sterling Field Support Center (SFSC).

Portable Hoist. A manually or electrically operated lifting device such as, but not limited to, chain falls, come-a-longs, chain hoists, lever operated chain hoists, cable hoists, etc.

Qualified Inspector. A competent person recognized by the U.S. Department of Labor as being authorized to provide testing to certify hoisting and rigging equipment.

Qualified Operator/Qualified Rigger. A person having training and knowledge to be capable of identifying existing and potential hazards associated with hoisting and rigging activities and having the authority to stop work.

Sheave. A grooved pulley.

Shock Loading. An unsafe hoisting and rigging activity caused by an unexpected slackening and re-tensioning of a load.

Sling. An assembly which connects the load to the material handling equipment. These can be made of rope, nylon, polyester, chain, wire rope, etc.

Station Manager. For the purpose of this procedure, the Station Manager shall be either the NWS Regional Director; Directors of Centers under NCEP (Aviation Weather Center, NP6; Storm Prediction Center, NP7; and Tropical Prediction Center, NP8); Directors of the NDBC, NWSTC, and Chiefs of NRC, ROC and SFSC facilities; or Meteorologist in Charge (MIC), Hydrologist in Charge (HIC), or Official in Charge (OIC).

Vehicle Winch. A device which is mounted on a vehicle which applies a force for vertical lifting or horizontal pulling.

22.3 Procedure

22.3.1 Qualified Riggers. The Qualified Rigger shall observe the following practices when performing hoisting and rigging operations:

a. Before each use, the sling and all attachments shall be inspected for damage or defects.

b. Slings and attachments that are damaged or defective shall not be used.

c. Slings shall not be shortened with knots or bolts or other makeshift devices.

d. Sling legs shall not be kinked.

e. Slings shall not be loaded in excess of their rated capacities.

f. Slings used in a basket hitch shall have their loads balanced to prevent slippage.

g. Slings shall be securely attached to their loads.

h. Slings shall be padded to protect them from the sharp edges of the load.

i. Suspended loads shall be kept clear of all obstructions.

j. All employees shall be kept clear of loads about to be lifted and of suspended loads.

k. Hands and fingers shall not be placed between the sling and its load while the sling is being tightened around the load.

l. Shock loading of slings and other hoisting and rigging equipment is prohibited.

m. A sling shall not be pulled from under a load when the load is resting on the sling.

n. The Qualified Rigger shall determine when additional personnel will be required solely to provide emergency medical assistance or to contact emergency services if necessary.

o. The Qualified Rigger shall determine when a spotter(s) is required to provide an additional measure of safety to the lift.

22.3.2 Making the Lift. When making the lift, the following guidelines shall be followed:

a. Identify the path of travel and the place where the load will be set down. Make certain the load will safely clear any obstructions.

b. As the lift starts, check to see that the slings, chains or lifting devices being used are well secured and free of twists and kinks. Make sure the load is properly balanced before it is raised more than a few inches. If it is not, set it down and readjust the hook-up.

c. Do not overload a hook or carry the load on the point of the hook. Always carry the load in the saddle of the hook.

d. Do not guide, position or alter a suspended load by hand if it has been raised above waist height. Use a tether rope having sufficient length to reach the floor or ground from the highest point the load can reach.

e. When guiding a load, keep hands clear of pinch points. Anticipate a quick take-up of the slack of the tether rope.

f. Do not walk or stand under a suspended load. Warn others to keep out from underneath the load being lifted by the crane. A hard hat area shall be established for all employees working close to or under a load, including employees managing a tag line.

g. Never walk between a stationary object and an object which is being moved.

h. Ensure that a clear line of communication exists at all times between the person directing the lift and the operator.

22.3.3 Moving the Load. As the load travels, the following guidelines shall be observed:

a. Do not carry loads over personnel.

b. Walk ahead of the load and give a clear warning to personnel on the ground.

c. Do not ride on a load or allow anyone else to do so.

22.3.4 Placing the Load. When setting the load down the following requirements shall be followed:

a. Carefully set up blocking if needed, so that slings, grab hooks or lifting devices can be easily removed from the load and prepared for the next move.

b. Hold onto slings firmly when removing them from the load. They may snap out or snag some object when removed.

22.3.5 Crane Operators. Qualified Crane Operators shall adhere to the following requirements:

a. Completely plan the lift prior to actually performing the lift.

b. Do not allow anyone to ride on the load.

c. Allow sufficient space to place the load down and ensure that it is properly supported.

d. Do not position a load over personnel and avoid placing it over another piece of equipment whenever possible.

e. Never leave a load unattended while suspended.

f. Do not raise a load any higher than necessary.

g. When turning a load, keep the load between 4 and 10 inches above the floor if possible.

h. Know the approximate weight of the load, its center of gravity, and specifications of the rigging hardware to ensure a safe lift.

i. When rigging outside, always take into account wind conditions, tag lines, ground conditions and crane limitations.

j. Make sure a clear line of communication exists between the person directing the lift and the crane operator.

k. The operator shall not engage in any practice which will divert his/her attention while actually engaged in operating the crane.

l. The operator shall respond to signals only from the person who is directing the lift or his/her appointed signaler. <u>However, the operator shall obey a stop signal at all times from anyone.</u>

m. During hoisting, care shall be taken to ensure that there is no sudden acceleration or deceleration of the moving load and that the load does not contact any obstructions.

n. When starting the bridge and when the load or hook approaches nearby personnel, a warning signal shall be sounded.

o. The operator shall not traverse loads over people.

p. The operator shall test the brakes each time a load approaching the rated capacity is handled by raising the load a few inches and applying the brakes.

22.3.6 <u>Crane Safety</u>. The following general crane safety guidelines shall be adhered to during all hoisting and rigging operations:

a. Before operating the crane:

(1) Thoroughly inspect the crane and the equipment used with it before each use. Do not operate a defective crane or use defective equipment.

(2) Check controls, the alarms or sounding devices, and the brakes. Check the rails for the presence of foreign objects. Whenever the main or emergency switch is open, do not close it until you are certain that no one is on or about the crane.

b. The crane shall not be loaded beyond its rated capacity.

c. The hoist chain or cable shall be free from kinks or twists and shall not be wrapped around the load.

d. The load shall be attached to the load-block hook by means of slings or other approved devices.

e. Care shall be taken to make certain that: the sling clears all obstacles; the multiple-part lines are not twisted around each other; the hook is brought over the load in such a manner as to prevent swinging; and the rope or cable is properly seated on the drum and in the sheaves.

f. The crane shall not be used for side pulls.

22.3.7 Stop Safety. The following requirements shall be followed when stopping a load:

a. Ensure that the load has come to a full stop prior to reversing the hoisting motors.

b. Do not use limit switches for stop switches.

c. Do not stop the load at high speeds within a short distance. This could increase stresses on the slings and crane.

d. Do not leave the crane controls unattended while the load is suspended.

22.3.8 Emergency Power Failure Procedures. If the power goes off, promptly move all controllers to the OFF position. Be sure that all controllers are in the OFF position before re-establishing power.

22.3.9 Equipment Maintenance and Inspections. Hoisting and rigging equipment shall be installed, maintained, operated, inspected and certified in accordance with ANSI Standards B30-2, B30-9, B30-10, B30-16; 29 CFR 1910.179, 1910.180, and 1910.184. Any equipment found to be in unacceptable condition shall either be tagged “Do Not Use” and repaired or shall be destroyed.

a. Initial and periodic inspections shall be conducted on all hoisting and rigging equipment. Attachment A, “Inspection Criteria” provides guidance for inspecting hoisting and rigging equipment. The equipment operator or rigger shall also perform a visual inspection prior to each use.

b. Prior to initial use, all new, reinstalled or extensively repaired cranes, hoists, slings, etc., shall be inspected and load tested to 125 percent of capacity and certified by a qualified inspector.

c. Visual inspections shall be conducted before each use. The following items shall be inspected for defects which might appear between annual inspections:

(1) All functional operating mechanisms and controls for proper operation and wear.

(2) Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.

(3) Hooks and retainers for deformations or cracks.

(4) Hoist chains, including end connections, for excessive wear, twisted or distorted links interfering with proper function or stretched beyond manufacturer's recommendations.

(5) Wire rope reeving for noncompliance with manufacturer's recommendations.

d. Annual sling and rigging accessory inspections shall be performed using criteria set forth in Attachment A of this Procedure. Written, dated and signed reports as provided in Attachment B shall be kept on file.

e. Inspection and Rated Load Test for Cranes and Hoists shall be performed annually by a qualified inspector and shall include a visual inspection and a load test that shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The maximum acceptable load and the date of the last test shall be posted on the crane or fixed hoist. The test reports shall be placed on file at the field office.

NOTE:	Portable hoists (chain falls, come-a-longs, etc.) are excluded from load tests. The hoists in the radar domes do not need to be load tested if a certification of its rated capacity is on file. If no certification is on file, an initial load test of these hoists must be performed.

f. A formal preventive maintenance program based on the operating equipment manufacturer's recommendations shall be established at all NWS locations with hoisting and or rigging equipment. The following guidelines shall be followed when caring for equipment:

(1) Cranes and hoists shall be lubricated and serviced as recommended by the equipment manufacturer.

(2) Store all lifting equipment in an orderly, safe manner that will protect it from damage when not in use. Straighten out slings before storing them.

(3) Do not paint hooks, slings and other lifting devices, as paint will cover up cracks and flaws.

(4) Immediately remove all defective equipment from service and report it to the Station Manager. Do not use the defective equipment or repair it yourself.

22.3.10 Training Requirements. Only qualified operators, those who received proper training and qualification, shall be permitted to operate hoisting and rigging equipment. The established qualified-operator training program shall include, but not be limited to: written tests, field training and trials, personnel physical requirements and examinations, trainee status and training procedures. Refresher training shall be provided, as required. Operating procedures for specialized equipment (e.g., portable hoists, radar hoists, and vehicle winches) will vary by manufacturer. The operator's manual for the equipment being used shall be referenced for these specific procedures.

Crane Operators shall be experienced and knowledgeable in:

a. Access and egress during normal and emergency conditions.

b. Normal and emergency power for the hoisting equipment.

c. Inspection and proper use of wire ropes, lifting attachments, slings and chains.

d. The hoisting drum and proper windings.

e. The use and operation of control devices.

f. Limit switches.

g. Brakes, both mechanical and solenoid types.

h. Safety devices such as fire extinguishers, signal horns, bells, etc.

i. Handling of the hoisting mechanism.

j. The purpose of and how to perform a test lift.

k. Hand and verbal signals

l. Operating procedures and safe practices.

m. Proper shutdown of equipment.

n. Release and lockout of crane for maintenance or overhaul.

o. Riggers shall be experienced and knowledgeable in:

(1) The safe use of synthetic slings, wire rope, portable manual hoists, uses of rope, shackles, hooks, hoisting principles, relative weight.

(2) Estimation, center of gravity, factors of safety and the effect of sling angles and angular loading.

(3) The safe attachment of slings for straight lifts, basket hitches, chokers and multiple-bridle lifting.

(4) The safe and unsafe placement of sling hooks.

(5) Hook safety latches and hook mousing for safety

p. Risks associated with rigging near power transmission lines, the mandatory safe distances, and the necessary precautions.

22.4 Quality Control

22.4.1 Regional or Operating Unit Environmental/Safety Coordinators

a. Shall perform an annual assessment of the regional headquarter facilities or operating unit to monitor and promote compliance with the requirements of this procedure.

b. Shall perform assessments or designate personnel to perform assessments of all field offices to monitor and promote compliance with the requirements of this procedure every two years.

22.4.2 Station Manager

Shall review, or delegate review, of this procedure on an annual basis to ensure that the facility is complying with its requirements. Confirmation of this review shall be forwarded to the Regional or Operating Unit Environmental/Safety Coordinator.

22.4.3 NWS Headquarters (NWSH)

a. The NWS Safety Office shall perform an annual assessment of the NWSH facilities to ensure that the facilities are in compliance with this procedure.

b. The NWSH Safety Office shall periodically perform an assessment of the regional headquarters and field offices to ensure compliance with this procedure. The frequency of these regional and field office assessments shall be determined by the NWSH Safety Office.

c. Requests for clarification concerning this procedure shall be directed to the NWSH Safety Office.

22.5 Responsibilities

22.5.1 Regional or Operating Unit Environmental/Safety Coordinators*

a. Shall monitor and coordinate to promote compliance with the requirements of this procedure for the regional headquarters, and field offices or operating units.

b. Shall ensure personnel operating cranes or rigging loads have been properly trained.

c. Shall ensure that a maintenance, inspection, and load testing program is in place for hoisting and rigging equipment.

22.5.2 Station Manager*

a. Shall have oversight over the implementation of this procedure, and ensure that the requirements of this procedure are followed by individuals at the NWS facility.

b. Shall ensure personnel using portable hoists have received training in accordance with the requirements of this procedure.

c. Shall ensure that portable hoists and any related slings, hooks, shackles, etc. are properly maintained and inspected and a record of the inspection maintained.

d. Shall ensure that initial and periodic inventory of hoists, slings and rigging equipment accessories is accomplished and adequate stock is maintained.

e. Shall ensure that contractors providing crane operations are familiar with the requirements of this procedure before any activity starts. A pre-work meeting with a contractor must be conducted to ensure that safety rules are understood.

Note: All Contractor work shall be performed shall be performed consistent with the Federal Acquisition regulations at 48 C.F.R. 52.236-13.

22.5.3 Safety or Environmental/Safety Focal Point*

Shall ensure that any responsibilities delegated to them by the Station Manager are implemented in accordance with the requirements of this procedure.

22.5.4 Employees

a. Individual employees affected by this procedure are required to read, understand and comply with the requirements of this procedure.

b. Report unsafe or unhealthful conditions and practices to their supervisor or safety focal point.

NOTE:	* - Reference NWS PD 50-11 for complete list of responsibilities http://www.weather.gov/directives/050/pd05011c.pdf

22.6 References

Incorporated References. The following list of references is incorporated as a whole or in part into this procedure. These references can provide additional explanation or guidance for the implementation of this procedure.

22.6.1 American National Standards Institute, ANSI B30-2, "Overhead and Gantry Cranes."

22.6.2 American National Standards Institute, ANSI B30-9, "Slings."

22.6.3 American National Standards Institute, ANSI B30-10, "Hooks."

22.6.4 American National Standards Institute, ANSI B30-16, "Overhead Hoists."

22.6.5 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.179, "Overhead and Gantry Cranes."

22.6.6 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.180, "Crawler Locomotive and Truck Cranes."

22.6.7 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.184, "Slings."

22.6.8 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1926.550, "Cranes and Derricks."

22.7 Attachments

Attachment A. Inspection Criteria

Attachment B. Inspection Record

ATTACHMENT A

Inspection Criteria

Synthetic Slings. **Synthetic slings shall be removed from service when any of the following deficiencies are visible:**

- Acid or caustic burns.
- Melting or charring.
- More than 5 percent of visible stitches or strands broken.
- Permanent elongation.
- Distorted fittings.
- Any other apparent defects which cause doubt as to the strength of the equipment.

Wire Rope Slings: Wire rope slings shall be removed from service when any of the following defects are visible:

- More than six randomly broken wires in one lay.
- Wear or scraping of one-third the original diameter of outside individual wires.
- Kinking, crushing, bird caging or any other damage resulting in distortion of the rope structure.
- Evidence of heat damage.
- End attachments that are cracked, deformed or worn.
- Any signs of corrosion.
- Any other apparent defects which cause doubt as to the strength of the equipment.

Shackles, Rings, etc.: Shackles, rings, etc., shall be removed from service when any of the following defects are visible:

- Wear, corrosion, spreading or deformation (greater than 10 percent of new condition).
- Visible cracking.
- Nonstandard shackle pins.
- Any other apparent defects which cause doubt as to the strength of the equipment.

Hoists: Hoists shall be removed from service when any of the following defects are visible:

- Upper and lower hooks do not swivel.
- Hooks are open more than 10 percent of the original dimension or twisted more than 10 degrees from centerline and/or show signs of cracking.
- Hook latches not intact and/or operable.
- Hoists dirty and/or show evidence of foreign material damage or undue wear.
- Load chain nicked and/or gouged which can cause stress concentrations. Imperfections shall be ground out and the new diameter checked with gauges or tables.

- Load chain in need of lubrication. However, internal hoist mechanisms shall be oil free.
- Any other apparent defects which cause doubt as to the strength or effective operation of the equipment.

ATTACHMENT B

Inspection Record

EQUIPMENT INSPECTION RECORD						
Inspector: _____					Date: _____	
Type	Size	Serial #	Rating	Location	Pass/Fail	Comments